

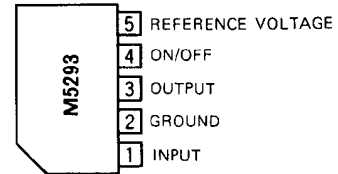
M5293L

FLUORESCENT CHARACTER DISPLAY TUBE (-32V FIXED-VOLTAGE POWER SUPPLY) IC

DESCRIPTION

The M5293L is a semiconductor integrated circuits that is designed as a constant-voltage negative power supply. Since this high-voltage type integrated circuits accepts a maximum input voltage of -60V and provides a fixed output voltage of -32V, it serves, for instance, as an ideal fluorescent character display tube drive power supply. As the output voltage is fixed inside the integrated circuits, only a capacitor is needed as the external part. Further, the use of a small-size 5-pin SIP assures high packaging density for power supply circuits.

PIN CONFIGURATION (TOP VIEW)



Outline 5P5T

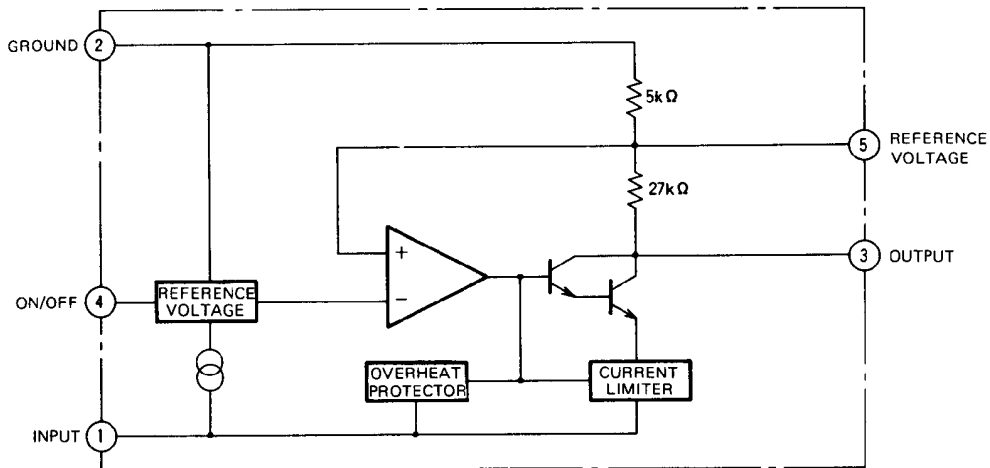
FEATURES

- High input voltage range $V_I = -20 \sim -60V$
- Fixed output voltage $V_O = -32V (I_{LP} = -30mA)$
Variable with an external resistor . . . $V_O = -10 \sim -50V$
- Output ON/OFF control (Terminal ④)
- Built-in current-limiting circuit.
- Built-in overheat protection circuit.

APPLICATION

CD players, VTR, and other general electronic equipment

BLOCK DIAGRAM

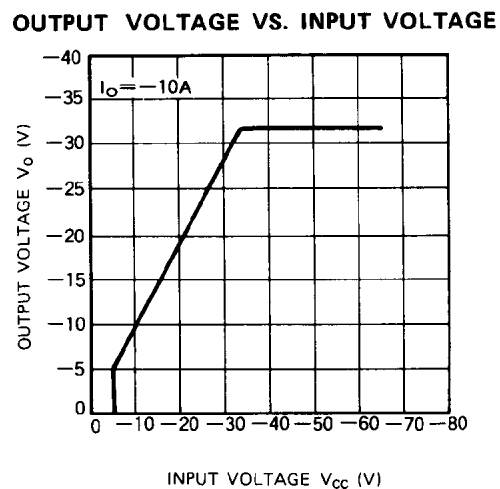
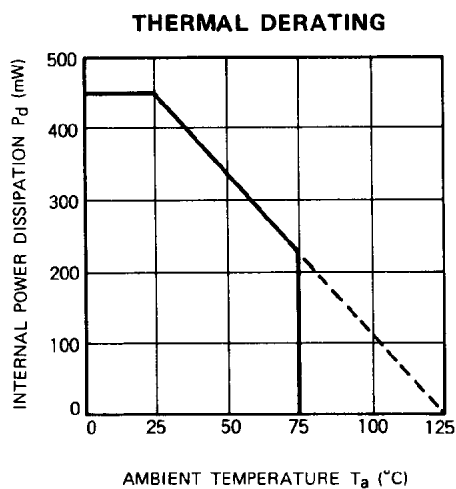


**FLUORESCENT CHARACTER DISPLAY TUBE
(-32V FIXED-VOLTAGE POWER SUPPLY) IC****ABSOLUTE MAXIMUM RATINGS** ($T_a = 25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_i	Input voltage		- 60	V
I_{LP}	Load current		- 30	mA
V_{DIF}	Input/output voltage differential		30	V
P_d	Internal power consumption		450	mW
K_θ	Thermal derating	$T_a \geq 25^\circ\text{C}$	4.5	mW/ $^\circ\text{C}$
T_{opr}	Operating ambient temperature		- 20 ~ + 75	$^\circ\text{C}$
T_{stg}	Storage temperature		- 55 ~ + 125	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($V_{IN} = -40\text{V}$, $I_O = -10\text{mA}$, $T_a = 25^\circ\text{C}$)

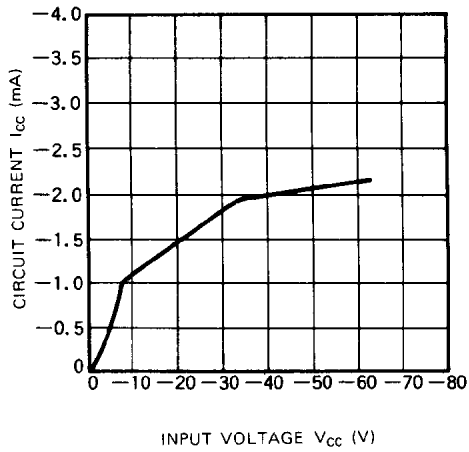
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I_{CC}	Circuit current	Under no load		- 2.0	- 6	mA
V_O	Output voltage		- 30.0	- 32.0	- 34.0	V
Reg-in	Input variation	$V_{IN} = -40 \sim -50\text{V}$		0.05	0.2	%/V
Reg-LO	Load variation	$I_O = -1 \sim -20\text{mA}$		100	400	mV
RR	Ripple rejection ratio	$C_{REF} = 0.1\mu\text{F}$, $f = 120\text{Hz}$	40	60		dB
V_{NO}	Output noise voltage	$f = 20\text{Hz} \sim 100\text{kHz}$		100		μV_{rms}
$V_{O(off)}$	Output cutoff voltage	$-0.3\text{V} \leq V_4 \leq \text{GND}$			0.1	V
V_{ref}	Reference voltage		- 4.65	- 5.0	- 5.35	V
V_{DIF}	Input/output voltage differential			1.5	3.5	V

TYPICAL CHARACTERISTIC

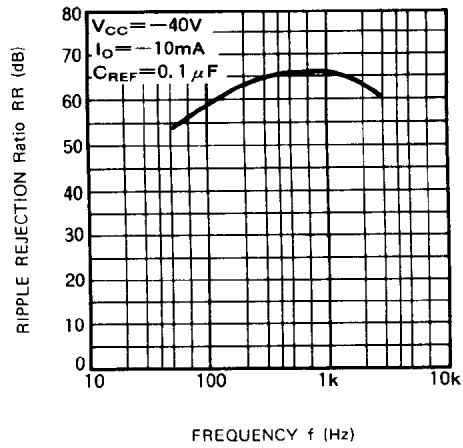
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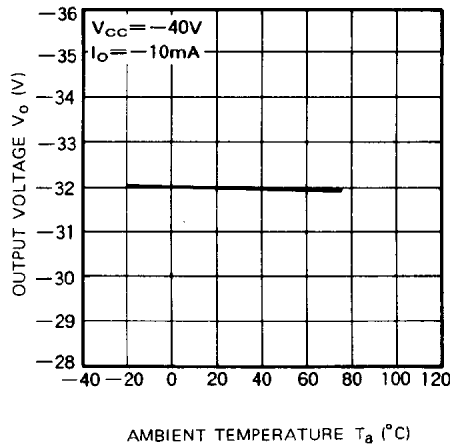
CIRCUIT CURRENT VS. INPUT VOLTAGE



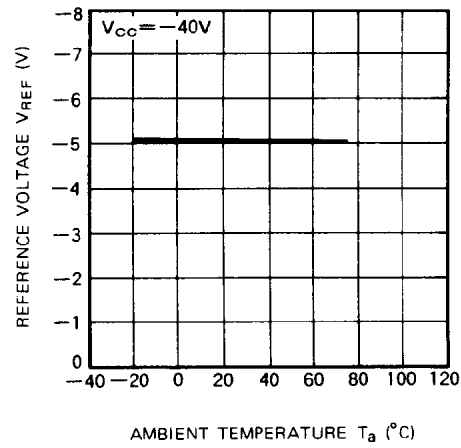
RIPPLE REJECTION RATIO



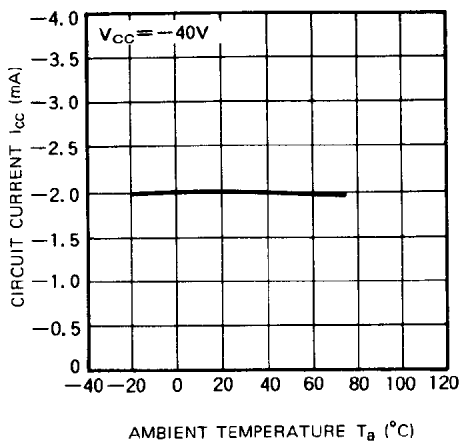
OUTPUT VOLTAGE VS. AMBIENT TEMPERATURE



REFERENCE VOLTAGE VS. AMBIENT TEMPERATURE



CIRCUIT CURRENT VS. AMBIENT TEMPERATURE

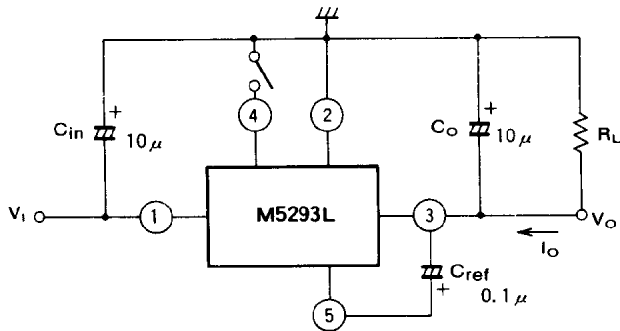


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APPLICATION EXAMPLES

(1) Standard Application Circuit Example



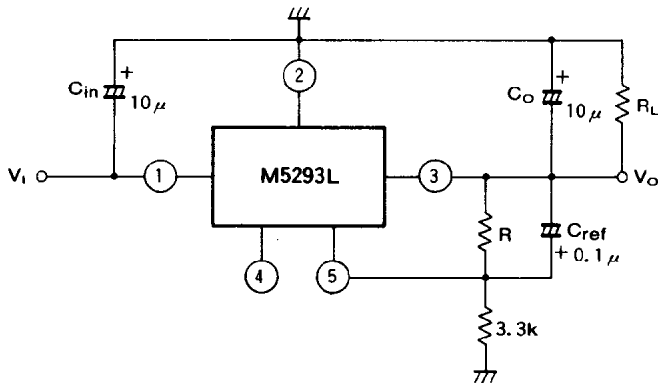
When terminal ④ is set at the ground level (0 to -0.3V), an output voltage of 0V can be obtained.

C_{REF}

Connection of this capacitor provides ripple rejection ratio improvement, output noise voltage improvement, and output voltage rise time constant adjustment (use a 1000pF to 1µF capacitor).

NOTE: Ensure that the capacitance of the employed capacitor does not significantly vary with the temperature.

(2) Output Voltage Variation Procedure



$$V_O = \left(1 + \frac{R//27k}{5k//3.3k}\right) \cdot V_{REF}$$

$$R = \frac{1}{\frac{1}{\left(\frac{V_O}{V_{REF}} - 1\right) \cdot 5k//3.3k} - \frac{1}{27k}}$$

$$(V_{REF} = 5.00V, 5k//3.3k = 1.988k)$$

(BUILT-IN RESISTORS
BETWEEN TERMINALS ② AND ⑤: 5kΩ
BETWEEN TERMINALS ③ AND ⑤: 27kΩ)